REMARKS

The above amendments to the above-captioned application along with the following remarks are being submitted as a full and complete response to the Office Action dated June 8, 2005 (U.S. Patent Office Paper No. 20050531). In view of the above amendments and the following remarks, the Examiner is respectfully requested to give due reconsideration to this application, to indicate the allowability of the claims, and to pass this case to issue.

Also, submitted concurrently herewith is an Information Disclosure Statement. Entry and consideration of this Information Disclosure Statement is respectfully requested.

Status of the Claims

As outlined above, Claims 1 through 9 are currently pending in this application. Claims 1 through 5 and 7 through 9 are being amended to correct formal errors and to more particularly point out and distinctly claim the subject invention. Entry of the amendments to Claims 1 through 5 and 7 through 9 is respectfully requested.

Additional Amendments:

The Specification has been amended to correct formal errors and to better disclose and describe the features of the present invention. Entry of the amendments to the Specification is respectfully requested.

Prior Art Rejections

Claims 1, 3 through 5, and 8 were rejected under 35 U.S.C. §102(b) over U.S. Patent No. 5,949,600 to Akiyama et al., hereinafter the Akiyama '600 Patent. This rejection is respectfully traversed.

Claims 2 and 9, and as understood Claim 6, were rejected under 35 U.S.C. §103(a) over the Akiyama '600 Patent in view of U.S. Patent No. 6,650,512 to Gill, hereinafter the Gill '512 Patent. This rejection is respectfully traversed.

Claim 7 was rejected under 35 U.S.C. §103(a) over the Akiyama '600 Patent in view of U.S. Patent No. 6,687,200 to Kobayashi, hereinafter the Kobayashi '200 Patent. This rejection is respectfully traversed.

The above rejections of Claim 1 through 9 will be considered collectively.

It is respectfully submitted that the Akiyama '600 Patent, the Gill '512 Patent and the Kobayashi 200 Patent do not disclose:

a magnetization control method including providing on the substrate a multilayer film including a first ferromagnetic metallic layer, a non-magnetic metallic middle layer formed on the first ferromagnetic metallic layer, and a second ferromagnetic metallic layer formed on the non-magnetic metallic middle layer and located facing the at least one metal probe, and providing an electric field between the at least one metal probe and the multilayer film to become the height of the potential barrier being effectively high or low compared with a reference value, and then recording information to the multilayer film by changing at least one direction of magnetization of the ferromagnetic metallic layers, as respectively recited in Claim 1;

an information recording apparatus, including a multilayer film including a first ferromagnetic metallic layer, a middle non-magnetic metallic layer formed on the first ferromagnetic metallic layer, and a second ferromagnetic metallic layer formed on the middle non-magnetic metallic layer and facing the at least one metal probe, and wherein the at least one metal probe is structured so that a distance between the at least one metal probe and the multilayer film is controlled so as not to contact the multilayer film, and an electric field between the at least one metal probe and the multilayer film is provided to become the height of the potential barrier being effectively high or low compared with a reference value for recording information to the multilayer film corresponding to the electric field by changing at least one direction of magnetization of the ferromagnetic metallic layers, as respectively recited in Claim 3;

an information recording apparatus, including a multilayer film including a first ferromagnetic metallic layer, a middle non-magnetic metallic layer formed on the first ferromagnetic metallic layer, and a second ferromagnetic metallic layer formed on the middle non-magnetic metallic layer and facing the at least one metal probe, and a controller whereby an electric field between the at least one metal probe and the multilayer film is provided to become the height of the potential barrier being effectively high or low compared with a reference value for recording information to the multilayer film corresponding to the electric field by changing at least one direction of magnetization of the ferromagnetic metallic layers, as respectively recited in Claim 4; and

an information recording apparatus, including a plurality of metal probes arranged at predetermined intervals in place of the at least one metal probe, wherein the multilayer film faces the plurality of metal probes, and a distance between the plurality of metal probes and the multilayer film is controlled, wherein an electric field between the plurality of metal probes and the multilayer film is provided to become the height of the potential barrier being effectively high or low compared with a reference value for recording information to the multilayer film corresponding to the electric field by changing at least one direction of magnetization of the ferromagnetic metallic layers, as respectively recited in Claim 7.

In this regard, referring to the attached sketch, "Attachment A" to this response, which based on Figure 2 of the above identified application, the sketch shows "the reference value 1". For example, illustrated in Figure 2 and in the attached sketch, the height of a potential barrier has been 4.8 eV already, even if there is no metal probe. (Please see Specification, Page 15, line 23 to page 16, line 5). Therefore, by way of example, "4.8 eV" is defined as "the reference value 1". Then, an electric field is provided between the metal probe and the multilayer film to become the height of the potential barrier being effectively high (the direction 1 in the sketch) or low (the direction 2 in the sketch) compared with the reference value 1, and then recording information to the multilayer film by changing at least one direction of magnetization of the ferromagnetic metallic layers.

Further, in this regard, referring to the Specification, at page 16, lines 7-18:

Since when the switch 17 is turned ON to set the potential of the metal probe 5 to positive (voltage E_0, the direction 1 in the sketch), the height of potential barrier becomes effectively low (the J value becomes (-) in the sketch), in the relative directions of magnetization of the ferromagnetic metallic layers 1 and 3, the state in parallel but in the opposite directions becomes stable. On the other hand, when the switch 18 is turned ON and potential of the metal probe 5 is made negative (voltage $-E_0$, the direction 2 in the sketch), in the relative direction of magnetization of the ferromagnetic metallic layers 1 and 3, the state in parallel and in the same direction becomes stable because the height of potential barrier becomes effectively high (the J value becomes (+) in the sketch).

Also, in this regard, continuing with reference to the Specification, at page 17, lines 16-23:

As can be seen by referring to Fig. 2, even if the height of potential barrier is about 2.9 eV, the magnetic interaction J exerting on between ferromagnetic layers 1 and 3 is nearly zero.

Therefore, by way of example, "2.9 eV" is defined as "the reference value 2". Since when the switch 17 is turned ON to set the potential of the metal probe 5 to positive (voltage E_0, the direction 3 in the sketch), the height of potential barrier becomes effectively high (the J value becomes (+) in the sketch), in the relative directions of magnetization of the ferromagnetic metallic layers 1 and 3, the state in parallel and in the same direction becomes stable. On the other hand, when the switch 18 is turned ON and potential of the metal probe 5 is made negative (voltage $-E_0$, the direction 4 in the sketch), in the relative direction of magnetization of the ferromagnetic metallic layers 1 and 3, the state in parallel but in the opposite directions becomes stable.

Therefore, in a magnetization control method and an information recording apparatus of the present invention, such as recited in Claims 1, 3 and 4, the electric field between the at least one metal probe, or the plurality of metal probes as recited in Claim 7, and the multilayer film is provided to become the height of the potential barrier being effectively high or low compared with a reference value for recording information to the multilayer film by changing at least one direction of magnetization of the ferromagnetic metallic layers.

In contrast, referring to the disclosure of the Akiyama '600 Patent and Figure 15 therein, "the magnetic recording medium 11 has the recording layer 13 and the non-magnetic layer 12 stacked in order on the medium substrate 10." (See Col. 15, lines 55-57 in the Akiyama '600 Patent).

Therefore, it is respectfully submitted that the Akiyama '600 Patent does not disclose or teach a three-layer structure for a multilayer film as in the present invention, and as respectively recited in Claims 1, 3, 4 and 7, such three layer structure including a first ferromagnetic metallic layer, a non-magnetic metallic middle layer formed on the first ferromagnetic metallic layer, and a second ferromagnetic metallic layer formed on the non-magnetic metallic middle layer. Rather, the Akiyama '600 Patent teaches two-layer structure. (See Col. 15, lines 55-57 in the Akiyama '600 Patent).

Further, in contrast, referring to Col. 1, lines 49-60 of the Akiyama '600 Patent, the Akiyama '600 Patent does not teach a recording method in relation to a three-layered structure for a multilayer film, as respectively recited in Claims 1, 3, 4 and 7, but rather discloses a two layer structure in relation to a reproducing method.

Also, the Akiyama '600 Patent does not disclose, such as recited in Claims 1, 3, 4 and 7, the electric field between the at least one metal probe and the multilayer film is provided to become the height of the potential barrier being effectively high or low compared with a

reference value for recording information to the multilayer film by changing at least one direction of magnetization of the ferromagnetic metallic layers in a three layer multilayer film.

Therefore, Akiyama does not disclose or anticipate Claims 1, 3, 4 and 7, as well as dependent Claims 5 and 8.

As to the rejection of Claims 2 and 9, and as understood Claim 6, over the Akiyama '600 Patent in view of the Gill '512 Patent, it is respectfully submitted that the Gill '512 Patent was only cited as disclosing a teaching "of an anti-ferromagnetic layer between the first magnetic layer and the substrate" and of "use of a GMR element" (U.S. Patent Office Paper No. 20050531, pages 4 and 5). Further, it is respectfully submitted that the Gill '512 Patent likewise does not disclose, such as recited in Claims 1, 3 and 4, the electric field between the at least one metal probe and the multilayer film is provided to become the height of the potential barrier being effectively high or low compared with a reference value for recording information to the multilayer film by changing at least one direction of magnetization of the ferromagnetic metallic layers in a three layer multilayer film, as described above.

Therefore, in view of the above discussion, Claim 2, which depends from Claim 1, Claim 6, which ultimately depends from Claim 4, and Claim 9, which depends form Claim 3 are not obvious over the Akiyama '600 Patent in view of the Gill '512 Patent.

As to the rejection of Claim 7 over the Akiyama '600 Patent in view of the Kobayashi '200 Patent, it is respectfully submitted that the Kobayashi '200 Patent was only cited as disclosing a teaching "a plurality of probes" (U.S. Patent Office Paper No. 20050531, page 6). Further, it is respectfully submitted that the Kobayashi '200 Patent likewise does not disclose, such as recited in Claim 7, the electric field between the plurality metal probes and the multilayer film is provided to become the height of the potential barrier being effectively high or low compared with a reference value for recording information to the multilayer film by changing at least one direction of magnetization of the ferromagnetic metallic layers in a three layer multilayer film, as described above.

Therefore, in view of the above discussion, Claim 7, which depends from Claim 4, is not obvious over the Kobayashi '200 Patent in view of the Gill '512 Patent.

Withdrawal of the rejections of Claims 1, 3 through 5 and 8 under 35 U.S.C. §102(e) and Claims 2, 6, 7 and 9 under 35 U.S.C. §103(a) is respectfully requested.

Reconsideration and allowance of Claims 1 through 9 are respectfully requested.

Conclusion

In view of all the above, Applicants respectfully submit that certain clear and distinct differences as discussed exist between the present invention as now claimed and the prior art references upon which the rejections in the Office Action rely. These differences are more than sufficient that the present invention as now claimed would not have been anticipated nor rendered obvious given the prior art. Rather, the present invention as a whole is distinguishable, and thereby allowable over the prior art.

Favorable reconsideration of this application as amended is respectfully solicited. Should there be any outstanding issues requiring discussion that would further the prosecution and allowance of the above-captioned application, the Examiner is invited to contact the Applicants' undersigned representative at the address and telephone number indicated below.

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